

WHAT IS CLAIMED IS:

1. An optical receiver module with a top open can (TO-Can) structure including a stem with holes thereon, the holes passing through both sides of the stem, and a
5 photo diode mounted on an upper side of the stem, for converting an optical input signal into an electric current, comprising:

a trans-impedance amplifier mounted the stem, for converting and amplifying the electric current output from the photo diode into radio frequency (RF) signals having opposite phases, and outputting the amplified RF signals to the outside via corresponding
10 output terminals;

signal leads passing through the holes formed on the stem, for outputting the RF signals having the opposite phases amplified by the trans-impedance amplifier to the outside;

ground leads extending from the stem, for grounding the stem to the outside of the
15 optical receiver module; and

waveguides mounted in a predetermined position the stem in order to match impedance between the trans-impedance amplifier and the leads, the waveguides conducting the RF signals output from the output terminals of the trans-impedance amplifier to the respective leads via corresponding electric paths.

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2. The optical receiver module of claim 1, wherein the waveguides comprise:

a first waveguide for conducting the RF signals having the opposite phases, output

via the output terminals of the trans-impedance amplifier, through corresponding electric paths; and

second waveguides interposed between the first waveguide and the leads, for conducting the RF signals having the opposite phases, conducted from the first waveguide,
5 to the corresponding signal leads.

3. The optical receiver module of claim 2, wherein the first waveguide comprises:

a dielectric layer;

10 two first metal plates formed to be separated from each other on the dielectric layer, the first metal plates being wire-bonded to the output terminals of the trans-impedance amplifier to conduct the RF signals having the opposite phases, output from the output terminals of the trans-impedance amplifier, to the second waveguides via corresponding electric paths; and

15 a second metal plate formed on a lower side of the dielectric layer, the second metal plate being bonded to the upper side of the stem to ground the first waveguide to the stem.

4. The optical receiver module of claim 2, wherein each of the second waveguides comprises:

20 a dielectric layer;

a first metal plate for conducting a corresponding RF signal conducted from the first waveguide, to a corresponding lead; and

a second metal plate formed on a lower side of the dielectric layer, the second metal plate being bonded to the upper side of the stem to ground the first waveguide to the stem.

5 5. The optical receiver module of claim 1, further comprising sealing glass provided in an empty space between the holes and the leads to fix the signal leads to the stem.

10 6. The optical receiver module of claim 3, wherein the second metal plate is a conductive cohesion agent applied between the dielectric layer and the upper side of the stem.

15 7. The optical receiver module of claim 1, wherein the signal leads extending from the stem have a coaxial cable structure, and are impedance-matched to the trans-impedance amplifier.

8. The optical receiver module of claim 3, wherein a width of the dielectric layer of the first waveguide is formed to approximate a width of the first metal plate, so that an electric field is restricted to an inside of the dielectric layer.

20 9. The optical receiver module of claim 4, wherein a width of the dielectric layer of the second waveguide is formed to approximate a width of the first metal plate, so that an electric field is restricted to an inside of the dielectric layer.

10. The optical receiver module of claim 3, wherein the first and second waveguides adjust impedances of the first and second waveguides by adjusting a width of the first metal plate and a dielectric constant and a thickness of the dielectric layer.

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11. The optical receiver module of claim 3, wherein the first and second waveguides reduce a signal loss and impedance mismatching due to inductance components of the signal leads protruding from an upper part of the stem and the wire-bonded conductive wires, by adjusting impedance of the first and second waveguides by
10 adjusting a width of the first metal plate and a dielectric constant of the dielectric layer and/or a thickness of the dielectric layer.

12. The optical receiver module of claim 1, wherein the first and second waveguides prevent a signal loss and impedance mismatching due to inductance
15 components of the signal leads protruding from an upper part of the stem and the wire-bonded conductive wires, by adjusting characteristic impedance of the first and second waveguides.

13. The optical receiver module of claim 1, further comprising a pair of
20 direction current (DC) leads protruding from the upper side of the stem in order to apply a DC power to the photo diode and the TIA.

14. The optical receiver module of claim 1, wherein electric connection between the first and second waveguides, electric connection between the first waveguide and the trans-impedance amplifier, and electric connection between the signal leads and the corresponding second waveguides are made with conductive wires by wire bonding.

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15. The optical receiver module of claim 1, wherein respective terminals of the photo diode are electrically connected to the DC leads with conductive wires by wire bonding.

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16. The optical receiver module of claim 1, wherein the signal leads and the ground leads are arranged in a center of the stem to align an optical axis of the optical receiver module with an optical axis of an optical transmitter module, so that when they are mounted on one printed circuit board (PCB), a loss of an RF signal and impedance mismatching are minimized.

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17. The optical receiver module of claim 16, wherein a cross-section of the ground leads is substantially larger than that of the signal leads are circular section forms.

18. The optical receiver module of claim 16, wherein a cross-section of the ground leads is substantially larger than that of the signal leads are rectangular section forms.

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